River Crossings

Applicability

River crossings are bridges or stable, shallow channel sections that provide a way for livestock, equipment, or vehicles to cross the river. They are often the only way, or the most convenient way, to access land or property. To reduce impacts to the river, the number of river crossings should be minimized, and low water fords should be used as infrequently as possible.

Figure 1: Public bridge across the Musselshell River.

This Best Management Practice (BMP) reviews the primary types of river crossings found on the Musselshell River. On-site observations of river crossings and discussions with Musselshell River water users are the basis for the information that follows.

Description

This River Crossings BMP addresses the following items:

I. ***River Crossings:*** There are two primary kinds of river crossings found on the Musselshell River.
II. ***Crossing Location:*** Considerations when siting a river crossing.
III. ***Design and Installation:*** Considerations when designing and installing a river crossing.
IV. ***Permitting:*** Permits needed for river crossing construction or maintenance.

I. River Crossings

There are two primary kinds of river crossings found on the Musselshell River: bridges and fords. From the South Fork downstream to Harlowton (38 miles), there are 16 bridges, 13 of which are privately owned. From Harlowton to Roundup (181 miles), there are 23 bridges, and 40% of those are privately owned. From Roundup downstream to Fort Peck (181 miles), there are only 11 bridges, nearly all publically owned. Between Shawmut and Melstone, there are several old Milwaukee Railroad crossings, some have been removed, others are in-place but not used, and a few are used for local traffic. Private ford crossings are common from Roundup downstream to Mosby.

Bridge Crossings: Bridges are used where access across the river is needed year around. When properly designed, a bridge can readily pass flood flows, floating debris, accommodate ice jams, and allow fish passage. Private bridges are often constructed with untreated/treated wood stringers and old railroad flat cars while public bridges are built using more substantial steel or concrete stringers.

Fords: A ford is a river crossing that is generally private and has on-farm occasional use. It is not usable during the late spring, high water months, or during the winter when there is heavy ice build-up. If a stream crossing needs to be used frequently, a bridge should be considered rather than a ford crossing.

II. River Crossing Location

When a river crossing is necessary, whether a bridge or ford, it should be located where the river channel is straight, unobstructed, and well-defined.

Bridges: Do not locate a bridge on a braided channel section. Instead, it should be located on a section of river that is straight, single-channel, relatively narrow with high banks. Sites are more stable where at least one bank is resistant to erosion, such as at the Highway 87 Bridge south of Roundup.

Fords: When choosing a ford crossing, factors to consider:

- Is it an existing, historic ford crossing;
- Is there natural rock armoring of the stream bed and banks;
- What are the number of crossings planned and the types of vehicles that will be using the crossing;
- What time of year will the crossing be needed;
- What is the permanence of the crossing site?

Stop in at your local NRCS office to view old aerial photography to help determine the stability of the river channel at the proposed crossing site. Old photography will show whether the channel has moved significantly over the last 50 years.

Figure 3: Ford crossing on the Musselshell River.

III. River Crossing Design

1) **Bridges:** The following recommendations are primarily focused towards private bridges. The following considerations are intended to present some basic principles, although any bridge will require site-specific design and may require the involvement of a licensed Montana engineer.

Public bridges are designed for heavy traffic and require detailed engineering designs and standards.

a. The length of the bridge span should exceed the width of the bankfull channel by at least 1.25 times.
b. The height of the bridge should be adequate to pass high water, floating debris, and ice jams. Too low of a bridge becomes a constant maintenance problem to the landowner and restricts stream flows.
c. Bridge abutments and wing walls should be positioned beyond the bankfull high water mark to prevent restriction of water flows. Abutments should have footings buried into the ground at least 3 feet and keyed into the adjacent bank. Armor both abutments and wing walls to prevent scouring beneath them.
d. Avoid center piers whenever possible. They tend to obstruct stream flows and catch floating debris.
e. Road approaches to the bridge should not be elevated and be maintained at the level of the floodplain to avoid creating a floodplain restriction or dike. If that is not possible, the design should incorporate flood bypass culverts through the approaches or a by-pass waterway around them.
f. Bridges should be maintained at least annually, preferably before high spring flows. Typical maintenance includes checking for structural deficiencies such as undermining and debris buildup.

2) **Fords:** Nearly all the ford river crossings on the Musselshell River are private. They are a much cheaper form of river-crossing than a bridge but may become impassable after a heavy rain, during spring runoff, and during winter ice. The following recommendations are geared towards ford crossings using the natural river bottom or placed rock. Concrete or geotextile-based ford crossing are not common on the Musselshell River so they will not be addressed in this BMP.

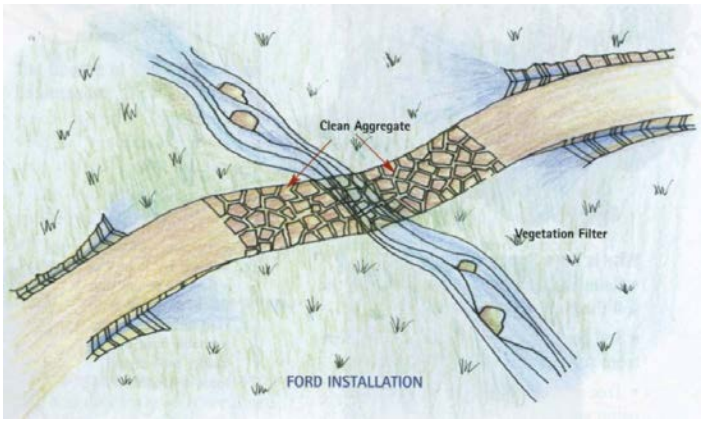

Figure 4: Ford crossing on the Musselshell River. Credit: Guide to Stream Crossings (Missoula Conservation District)

a. Ford crossings should be shallow enough to be crossed by farm vehicles and equipment.
b. On a straight section of river channel, find a shallow riffle with a firm streambed. If additional rock is necessary to provide stability, it is preferable to use angular rock slightly

larger than what you see in your stream bottom. Angular rock resists movement by interlocking.

c. Streambank approaches should be perpendicular to the river. Make the approaches stable with gradual ascent and descent grades not steeper than 4H:1V with minimal disturbance to the river bank. The road approaches should be graveled or rocked to minimize erosion.
d. Maintain the stream gradient above and below the ford crossing. This will allow better fish passage and will reduce the maintenance requirements of the ford.
e. Plant all disturbed areas soon after construction. Native plant species are preferred. Manage for noxious weed infestations.

IV. Permit Requirements

Prior to beginning any activity that physically alters or modifies the bed or banks of a perennially flowing stream, producers should use the joint application http://dnrc.mt.gov/Permits/StreamPermitting/JointApplication.asp to apply to the local Conservation District (CD) for a Natural Streambed and Land Preservation Act (310 Permit). This joint permit also serves to apply for a Federal Clean Water Act Dredge and Fill Permit (404 Permit)from the US Army Corps of Engineers , as well as various other permits potentially needed from Montana Fish, Wildlife & Parks, and Montana Department of Environmental Quality. For more information on all permits needed to work in and near streams in Montana see "A Guide to Stream Permitting in Montana" which is available at the local CD office or online at: http://dnrc.mt.gov/Permits/StreamPermitting/Guide.asp.

Air photos courtesy of Chris Boyer, Kestrel Aerial Services Inc. http://www.kestrelaerial.com/